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Degraded Peri-Ocular Image Recognition in Enrollment System Using Deep Neural Networks

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ABSTRACT: The biometric is used for identification purpose because of its uniqueness in individuals and invariant over time. Biometrics such as signatures, photographs, fingerprints, voiceprints and retinal blood vessel patterns all have noteworthy drawbacks. Although signatures and photographs are cheap and easily forged. Human iris on the other hand because of its speed, reliability and automation, is a perfect biometric for an identification system and easily visible from within one meter of distance and also protected from the external environment. The automated method of biometric identification is iris recognition which uses some mathematical pattern recognition technique on images of eyes and from that the iris will be recognized. In this work it is proposed to implement a face and iris recognition system, where HAAR and deep neural network is used to segment the face, eye and iris region. A template of the detected region is created using template matching for recognition is based on features in real time enrollment system. The result shows that the proposed method is efficient for iris based biometric recognition.

KEYWORDS: Periocular recognition, biometrics, deep neural network, HAAR cascade.

I.INTRODUCTION

In this paper we are considering the biometrics authentication which is used in computer science as a form of identification and access control. It is used in verifying identity than token and knowledge-based methods and for identifying individuals in the groups. The functionality of it has many different aspects of human physiology, chemistry or behavior can be used for biometric authentication. The biometric system has two basic modes. In the first mode verification of the system is done. It performs one-to-one comparison of a captured image that is done with a specific template stored in a biometric database to verify the individual. In the verification of a person three steps are included.

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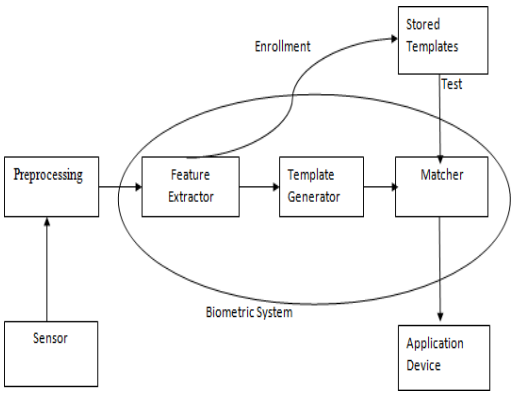

FIG 1: BASIC STRUCTURE OF BIOMETRICSYSTEM

In the initial step,reference models for all of the customers are delivered and set away in the model database. In the second step, a few examples are coordinated with reference models to produce the certified and impostor scores and calculate the threshold. Third step is the testing process. Second, in identification mode the system plays out a one-to-numerous examination against a biometric database trying to set up the personality of an obscure person. The system will succeed in identifying the individual if the examination of the biometric test to a layout in the database falls inside a recently set limit. In the multimodal biometric, systems use multiple sensors or biometrics to overcome the limitations of unimodal biometric systems Instance iris recognition systems can be undermined by maturing irises and finger filtering frameworks by exhausted or cut fingerprints. While unimodal biometric frameworks are constrained by the honesty of their identifier, it is improbable that few unimodal frameworks will experience the ill effects of indistinguishable confinements. Multimodal biometric systems can obtain sets of information from the same marker or information from different biometrics.

In existing system, proposed a new feature extraction algorithm based on Independent Component Analysis (ICA) for iris recognition. An ordinary strategy dependent on Gabor wavelets should choose the parameters (e.g., spatial area, introduction, and recurrence) for fixed bases. ICA is applied to generate optimal basis vectors for the problem of extracting efficient include vectors which speak to iris signals. The premise vectors learned by ICA are restricted in both space and recurrence like Gabor wavelets. The coefficients of the ICA development are utilized as feature vector. At that point, every iris highlight vector is encoded into an iris code. And furthermore introduced a private biometrics plan which depends on the camouflage of irregular piece and the iris pictures to combine minimum average correlation energy (MACE) filter for iris authentication. In particular, the preparation pictures are duplicated with the client explicit irregular portion in recurrence space before biometric channel is made. Another significant issue is that PC clients have turned out to be excessively trusting. They routinely use the same password to enter both secure and insecure Web sites as well as their networks at work. Because of the demonstrated absence of security given by secret phrase confirmation, network administrators are replacing network passwords with smartcards, biometric authentication, or a combination of the three. Smart cards are credit card-size devices that engender random numbers about every minute, in a state of harmony with partners on every section point in the system. Smart cards work well as long as the card isn't stolen Smart cards work well as long as the card isn't stolen.

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A superior decision to guarantee arrange security is the utilization of biometrics. Their paper investigated the different biometric techniques on hand to determine a person's identity. The disadvantages of this system are,

1. Difficult to predict the iris without advance scanners
2. Iris features can't extract at the time of degradation factors
3. Accuracy can be less at recognition time at certain instance due to deterioration
4. Complexity is high

II.LITERATURE SURVEY

Chen, Ying, et al[1] has proposed three discriminative feature selection strategies and weighted sub region matching method to improve the performance of iris recognition system. Firstly, they introduced the process of feature extraction and representation based on scale invariant feature transformation (SIFT) in detail. Secondly, three strategies were described, which are orientation probability distribution function (OPDF) based strategy to delete some redundant feature key points, magnitude probability distribution function (MPDF) based strategy to reduce dimensionality of feature element, and compounded strategy combined OPDF and MPDF to further select optimal sub feature. Thirdly, to make matching more effective, this paper proposed a novel matching method based on weighted sub- region matching fusion. In this particle swarm optimization is utilized to accelerate and achieve different sub-region's weights and then weighted different sub regions' matching scores to generate the final decision. In this paper assigning of weighted coefficients for three sub regions of segmented iris by training scheme is not accorded with iris intrinsic feature distribution characteristics, and PSO method for accelerate training process is not done effectively.

Chun-Wei Tan and Ajay Kumar[2] has proposed a set of coordinate pairs, which is referred as geometric key, that is randomly generated and exclusively assigned to each subject enrolled into the system and it defines the way how the iris features are encoded from the localized iris region pixels which involves computationally efficient and fast comparison operation on the locally gathered picture patches utilizing the areas characterized by the geometric key The image patches involved are more tolerant to the noise. Scale and rotation will change in the localized iris region is well accommodated using the transformed geometric key. Then the binarized encoding of such local iris features allows efficient computation of their similarity using Hamming distance. the iris encoding and matching strategy as investigated has encouraging matching accuracy, especially for the visible-light iris images. In this paper it is not directed to improve the recognition accuracy for the distantly acquired iris images and it does not have localized and user-specific strategies.

JiwenLu, Yap-Peng Tan and Gang Wang [3].In this paper, they proposed a new neighborhood repulsed metric learning(NRML) method for kinship verification. Moreover, they proposed a multiview NRML(MNRML) method to seek a common distance metric to make better use of multiple feature descriptors to improve the verification performance. They proposed discriminative multi-manifold analysis (DMMA) method to address the single sample per person (SSPP) problem in face recognition. They partition each enrolled image into several non-overlapping patches, and construct an image set for each sample per person, and then learn multiple feature spaces to maximize the manifold margins of different persons. The drawback of this system is they don't extend the proposed DMMA method to multiple samples per person (MSPP) face recognition.

Junlin Hu, Jiwen Lu, and Yap-Peng Tan [4] In this paper, they consider the face verification where face images contain significant variations caused by varying lighting, expression, pose, resolution, and background. It presents a new discriminative deep metric learning (DDML) method for face verification in the wild which aimed to learn a Mahalanobis distance metric to maximize the inter-class variations and minimize the intra-class variations, this trains a deep neural network which learns a set of hierarchical nonlinear transformations to project face pairs into the same feature subspace, under which the distance of each positive face pair is less than a smaller threshold and that of each negative pair is higher than a larger threshold, so that discriminative information can be exploited in the deep

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network. Their method achieves very competitive face verification performance on the widely used LFW and YouTube Faces (YTF) datasets but applying of DDML method to other visual applications such as image classification and activity recognition cannot be done.

NallaPattabhiRamaiah and Ajay Kumar [5] .In this paper, they developed and investigated two approaches to address the cross-domain iris recognition problem. In the first approach, they proposed a classification framework based on Naive-Bayes Nearest-Neighbor (NBNN) domain adaptation in order to improve the matching performance for cross-domain (cross-spectral/cross-sensor) iris recognition systems. The NBNN classifier uses the image-to-class (I2C) distance learning. This paper introduces a new algorithm using Markov random fields (MRF) model to significantly improve cross-domain iris recognition. The proposed area adjustment system dependent on the naive Bayes closest neighbor order utilizes a genuine esteemed element portrayal which is fit for learning space information. This approach estimated corresponding visible iris patterns from the synthesis of iris patches in the near infrared iris images achieves outperforming results for the cross spectral iris recognition. In this paper, a new class of bi-spectral iris recognition system that can simultaneously acquire visible and near infra- red images with pixel-to-pixel correspondences is proposed and evaluated. This paper presents experimental results from three publicly available databases; PolyU cross-spectral iris image database, IIITD CLI and UND database, and achieves outperforming results for the cross-sensor and cross-spectral iris matching. The drawback of this system is it does not recover discriminant features from the periocular region that can help to further improve matching accuracy for cross-spectral iris recognition.

NedaAhmadi, and GholamrezaAkbarizadeh[6]The current study proposes a novel human iris recognition approach based on a multi-layer perceptron NN and particle swarm optimization (PSO) algorithms to train the network in order to increase generalization performance. A combination of these algorithms was used as a classifier. A pre-processing step was performed on the iris pictures to improve the outcomes and two-dimensional Gabor part highlight extraction was connected. The information was standardized, prepared, and tried utilizing the proposed technique. A PSO algorithm was applied to train the NN for data classification. The test results demonstrate that the proposed strategy performs superior to anything numerous other surely understood methods. The benchmark Chinese Academy of Science and Institute of Automation (CASIA)- iris V3 and Center for Machine Learning and Intelligent Systems at the University of California, Irvine (UCI) AI archive datasets were utilized for testing and correlation. The drawback of this system is it does not give any combination of fuzzy systems and MLPNN–PSO methods.

SaiyedUmer, Bibhas Chandra Dhara, and BhabatoshChanda[7] A new set of features for personal verification and identification based on iris image is proposed in this paper. This method consists of three major components: image pre-processing, feature extraction and classification. During image pre-processing, the iris segmentation is done using Restricted Circular Hough transformation (RCHT). The feature extraction from iris pattern is based on multiscale morphologic operator. In this approach, the iris features are represented by the sum of dissimilarities obtained by applying morphologic top-hat transform.The multi-class problems is transformed to two-class problem for classification purposes. In this paper, they have adopted a fast method for iris localization. Second, only a part of iris image (to avoid occlusion problem) is used for authentication. Finally, multiscale morphologic features are extracted from sharpened segmented iris image and a SVM is used as the classifier. The drawback in this system is they don't combine more modalities and fusion techniques to build better multimodal biometric system.

ShervinMinaee, AmirAliAbdolrashidi and Yao Wang[8] In this paper, two powerful sets of features are introduced to be used for iris recognition: catering transform based features and textural features. Principal Component Analysis (PCA) is also applied on the extracted features to reduce the dimensionality of the feature vector while preserving most of the information of its initial value. Minimum distance classifier is used to perform template matching for each new sample. No segmentation is performed to extract iris region from the eye image in our work,

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which makes it much easier to implement. In this work, two sets of features are extracted from iris images, one of them being the recently introduced set of scattering-transform features and the other one being that of textural features to capture the texture information of irises. They believed that if these features are combined, they will provide a high discriminating power to conduct the recognition task. The drawback of this system is they didn't applied the proposed set of features for more challenging iris datasets and also other biometric recognition problems.

SirvanKhalighi, et al[9] This paper gives contributions for a reliable iris recognition method using a new scale, shift and rotation invariant feature-extraction. A 2-level non-subsampled contour let transform (NSCT) is applied on the normalized iris images and a gray level co-occurrence matrix (GLCM) with 3 different orientations is computed on both spatial image and NSCT frequency sub-bands. Moreover, the effect of the occluded parts is reduced by performing an iris localization algorithm followed by a four regions of interest (ROI) selection. The extracted feature set is transformed and normalized to reduce the effect of extreme values in the feature vector. The selected feature set is classified using support vector machine (SVM).

Yaser Khan Daanial, et al[10] In this paper a biometric system for recognizable proof of an individual utilizing the iris picture. The iris is first divided from the obtained picture of an eye utilizing an edge discovery calculation. The circle molded region of the iris is changed into a rectangular structure. Depicted minutes are extricated from the dim scale picture which yields an element vector containing scale, turn, and interpretation invariant minutes. Pictures are bunched utilizing the k-implies calculation and centroids for each group are figured. A discretionary picture is expected to have a place with the group whose centroid is the closest to the component vector as far as Euclidean separation registered. Yet, the exactness in this framework is less.

III.METHODOLAOGY

In our method we include image acquirement, segmentation, normalization, pattern generation and matching. Automatic iris recognition system is reliable for automatic personal identification. This research aims to recognize and identify iris among many that were stored in database. It is includes, after entered iris image, image preprocessing, feature extraction based on texture analysis using Haar Wavelet transform to capture both local and global features details in an iris and iris identification (matching process) based on the distance between the new input iris and templates stored in the database then choose the minimum distance between them. So the score degree can determine the genuine or imposter person. The database can display information about any processed iris. The study conclusion that Haar wavelet transform was efficient distinguished and noise sensitive under different conditions. The advantages are,

- Iris has a fine texture and cost effective
- Highly stable and Highly accurate irrespective of deterioration
- Without scanners recognize the iris easily

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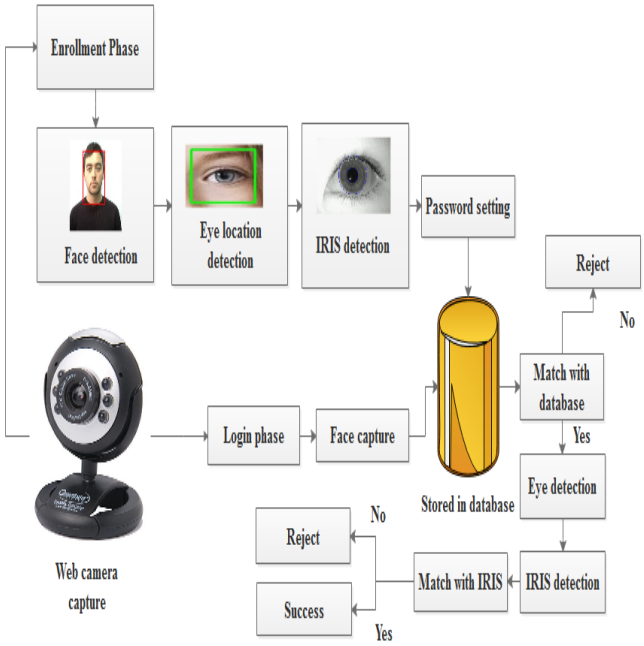

FIG 2: SYSTEM ARCHITECTURE

IRIS IMAGE ACQUISITION:

In this module, image of iris is first acquired with the help of web camera. The human Iris picture is caught utilizing an infrared camera which is fixed without a laser check framework to get a superb picture from framework. There are a few measurements of the infrared lit up picture with obvious extents: iris edges, nerves, and tombs are by and large increasingly clear here; the edges and boundaries of the iris image in between the iris and the pupil more dealt and image is being stored in database to process the dataset.

Implementation of HAAR Cascades is done to detect face images and eyes. The HAAR Cascade algorithm works by following steps,

- Collecting images
- Arrangement of negative images
- Crop the image and mark the positive images
- Creating a vector of positive images
- Collects the feature from it and then matches it.

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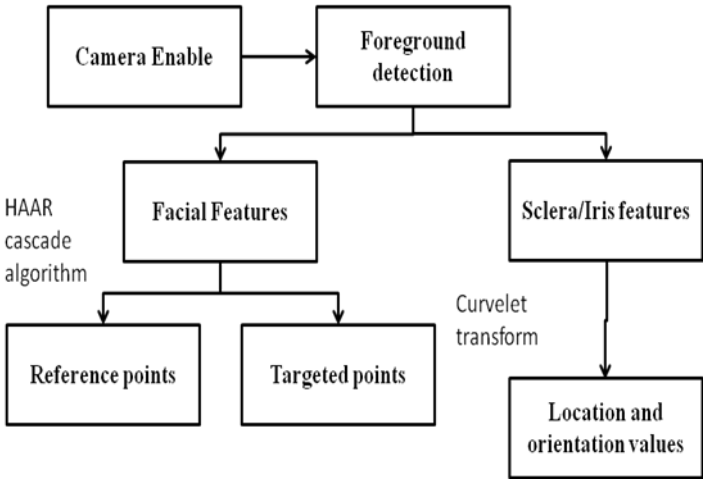

B.IRIS FEATURES EXTRACTION:

It is used to separate iris from eye images using curvelet transform algorithm to extract iris features.The Curvelet transform is a higher dimensional generalization of the Wavelet transform designed to represent images at different scales and different angles. The steps of curvelet transform are,

- Sub-band decomposition
- Segmentation
- Partitioning
- Renormalization
- Ridge let analysis

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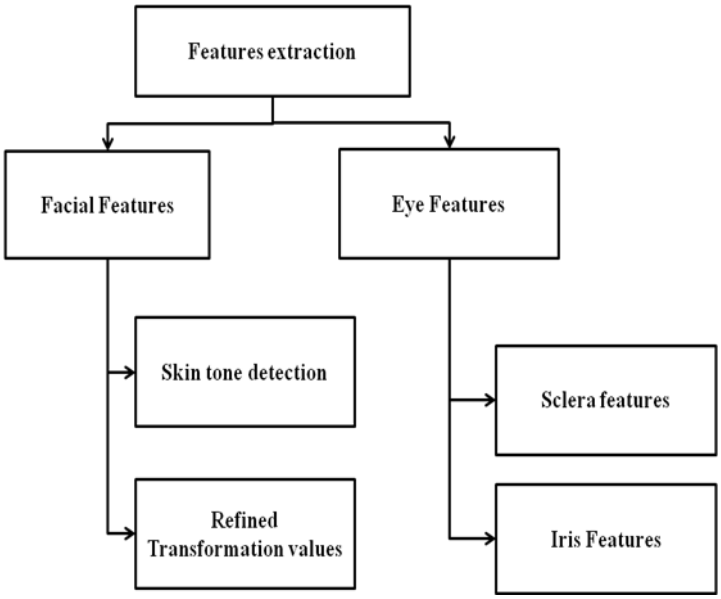
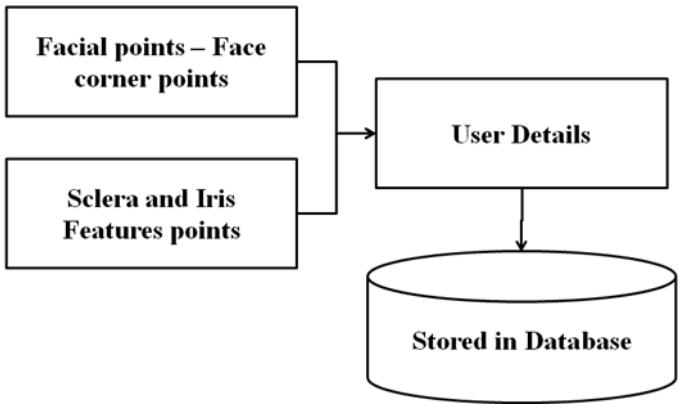


C.ENROLLMENT IN DATABASE:

In this module, iris features are stored in database. We can store iris for improved authentication. Then we stored these features numerical values instead of templates. These features are saved along with registered details such as name, id, phone number, email and so on.



D.FEATURES MATCHING:

Feature matching phase identifies similarities between current IRIS features and previously stored features. Input images provided to the system are matched with previously stored features present in database. Matching is

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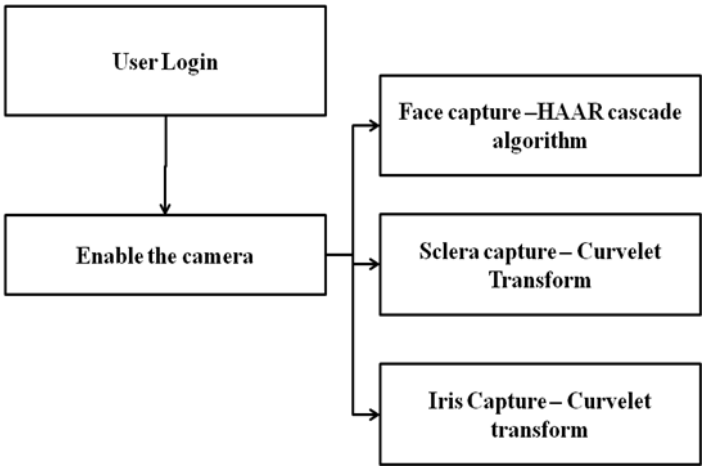
entirely dependent on whether the system Performs identification or verification. If it performs identification i.e. one-to-many matching approach is used, where iris of an individual matches with all available templates in database otherwise one-to-one match is done for verification, where input image of a person is matched with iris features. It can be done by classification algorithm which is the standard way of training neural networks. It works fundamentally like this: The info design on which the system is to be prepared is exhibited at the information layer of the net and the net is run typically to perceive what yield it really produces. The genuine yield is contrasted with the ideal yield for that input example. The differences between actual and desired form an error pattern. Extract the features for both fingers at testing side. These features are matched with data base using classification approach. If there is match found means, user can be register into system, otherwise rejected



E.FEATURES MATCHING:

This stage is known as login stage. Client can go into the framework utilizing client name and password. After that detecting eyes of same individual with sub grouping press. Eye highlights are required to check whether the information picture is same as that put away in the database. In the event that the curvlet change space is limit of the iris area than the edge henceforth no fringe is fit into the locale comparing to the no impeding eyelid district which is segregated. The line are confined both in outside and inside locale of understudy. Subsequently the thresholding to the pixels is done to disengage the eyelashes and eyelid to get the required piece of the eye picture to distinguish the ideal iris. The means that are taken to recognize the limit of the iris are as per the following: The limit is extricated by applying the vigilant edge identified technique. The curvlet change is being connected to distinguish the ideal Hough hover of the iris picture. The eyelashes and eyelids are being secluded to get the ideal transitional iris picture from the eye picture database that is being chosen.

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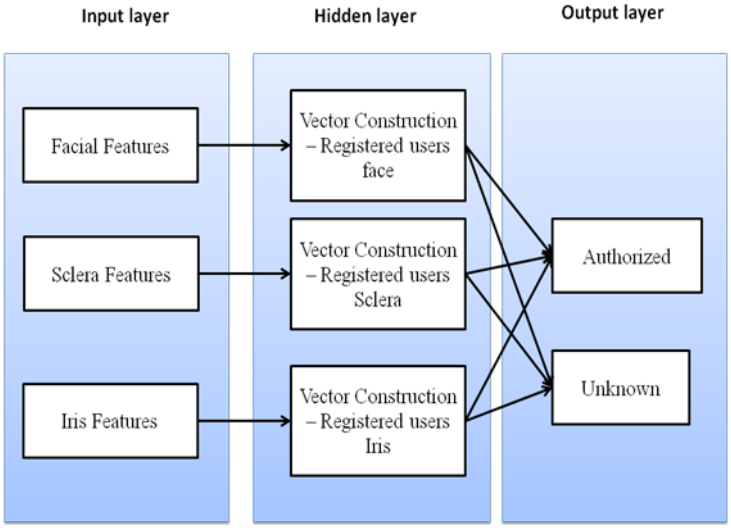

IV.CONCLUSION

This project proposes a methodology for system security by methods for biometrics. Biometric frameworks are regularly used to sort out getting to of physical resources, for example, research facilities, structures, money from ATMs, and so forth., or coherent data, for example, PC accounts, secure electronic reports, and so on. The human biometrics like unique mark, hand geometry, face, retina, iris, DNA, mark and voice can be viably used to guarantee the system security. In biometric cryptosystems, a cryptographic key is gotten from the biometric layout of a client put away in the database so that the key can't be uncovered without an effective biometric confirmation. A proposition calculation for iris acknowledgment has been introduced. HAAR change is helpful for division of the iris in light of effective confinement. The HAAR highlights has various Advantages, it is thoughtfully basic, quick, memory productive. In this framework, the idea in the regions of picture preparing procedure is reused to remove the details from Iris biometric picture. The preprocessing methods anticipated in this venture assume a critical job in improving the execution of the proposed biometric based system security framework. The execution measures got uncovered that the proposed strategy viably gives organize security. Along these lines it tends to be straightforwardly connected to fortify existing standard single-server biometric based security applications.

V.FUTURE ENHANCEMENT

These days everybody is utilizing Internet on mobiles. So we can build up an android App for checking the IRIS biometric. We can utilize our inbuilt versatile camera for catching IRIS picture and develop calculations for improving the picture improvement with upgraded highlights extraction. Highlight extraction is the core of an example acknowledgment framework. In example acknowledgment, highlights are used to recognize one class of example from another. The example space is more often than not of high dimensionality. The target of the

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component extraction is to portray the item, and further, to lessen the dimensionality of the estimation space to a space reasonable for the use of example grouping systems. And furthermore actualize this application in bank security. In day by day life, utilization of banking applications is expanded steadily.

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